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Body Weight Perception and Weight Control Behaviors among School Adolescents in Pulau Pinang

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Abstract: This study was conducted to determine the associations between body mass index (BMI), body weight perception and body shape among male and female adolescents. Besides, the aim of this study was to identify the differences in weight control behaviours between male and female adolescents. This cross-sectional study involved 194 subjects (98 males and 96 females) who were randomly selected from two secondary schools in Pulau Pinang. Subjects involved, were in the range of 16 and 17 years old. Information on socio-demographic, body image perception, body shape and weight control behaviors were obtained through questionnaires. Anthropometric measurements of body weight and height were also taken. Based on BMI categories (WHO, 2007), the results showed that 12.9% of the study subjects were classified as underweight, 55.2% normal weight, 17.5% overweight and 14.4% obese. The study found that the actual weight (BMI) of subjects were significantly associated to the body weight perception in overall and also for both sexes ($p < 0.05$). There was a significant association between the selection of the current body shape and ideal body shape for both sexes ($p < 0.05$). BSQ scores also showed a significant association with actual weight (BMI) for both sexes ($p < 0.05$). This study showed that there was a significant association between males and females ($p < 0.05$) based only on 2 out of 12 items of healthy weight control behaviors used in food diet and increasing physical activity. While for the 3 out of 9 items of unhealthy weight control behaviors used in skipping meals, starting the use of tobaccos and fasting, the study showed that there was a significant association between the sexes ($p < 0.05$). Therefore, by understanding the reasons for gender differences in the actual weight and weight perceptions, it could assist health professionals in helping a person to make a strategic decision to control body weight thus could help avoid the risk of eating disorders.

Key words: Body mass index, body weight perception, eating disorders, weight control behaviors

INTRODUCTION

Body image concerns are common among adolescents as they undergo rapid physical growth and body shape changes (Khor *et al.*, 2009). Body image plays an important role in the management of body weight, especially among female adolescents (Pon *et al.*, 2004). According to Maruf *et al.* (2012), body image represents internal image from a pictorial stimulus whereas perception of body weight is an abstract internal image. Body image can be defined as the way people see or think about their bodies and how they are viewed by others (Khor *et al.*, 2009). Body image is a complex phenomenon (Banfield and McCabe, 2002) and may involve perception, affective disorders, cognitive or behavioral disorders (Pelegri and Petroski, 2010). Several previous studies have shown that Malaysians are very concerned with their body image. However, studies which focused on body image in Malaysia are still very limited. Body image disorder is a condition in

which a person cannot see him/herself exactly in front of the mirror and having misconceptions of his/her characteristics and body sizes. Having a distorted body image is a risk factor for the development of disordered eating behaviours and eating disorders.

Perception of one's body weight and shape leads to the person's nutritional habits and weight management efforts. It may lead to abnormal eating patterns hence at risk of having eating disorders. Body weight perception is one of the factors involving oneself in the weight management practices such as diet or exercise control (Cash, 2004). An inaccurate weight perception is quite a concern among those who are overweight (Viner *et al.*, 2006) and may lead to unhealthy weight control behaviours. According to Virginia and Nicholas (2003), self-perception towards body weight is one of the important diet components and weight control behaviours.

Overweight and obesity are increasing in all age groups (Wang and Dietz, 2002) and as a result, obese

adolescents are experiencing problems associated with the acceptance of their body image and begin to make wrong assessment of their own weight (Pelegriani and Petroski, 2010). Body weight perception and BMI are closely related to weight management control. Body weight perception is not accurate when compared with the actual BMI, thus, it is not suitable for use as a determinant for the control of weight management (Cash and La barge, 1996). Understanding the perception of a person's weight is important to improve the appropriate weight control behaviour (Wong *et al.*, 2011). One of the major factors that leads to unhealthy eating habits is dissatisfaction with body shape (Stice, 2001). This causes a chronic diet and finally to the actual eating disorder.

Prevalence of obesity is increasing rapidly throughout the world. Appropriate perception of one's own body weight is important for improved weight control behavior (Muhihi *et al.*, 2012). Discrepancies between actual weight and weight perceptions can lead individuals to unhealthy weight control behaviours and thus increases the overweight and obesity scenarios. It is a matter of concern as the overweight adolescents have a high risk to become an overweight or obese adult. Therefore, the objective of this study was to determine the associations between BMI with weight perception and body shape by sex. Besides, this research was carried out to determine the differences of body weight control behaviors by gender.

MATERIALS AND METHODS

Subjects and study location: Sample size required for the study was calculated based on the formula provided by Daniel (1999). This cross sectional study was conducted in Pulau Pinang from June to October in 2013 from two secondary schools named High School Bukit Mertajam and Seberang Jaya Secondary School respectively. Random sampling method was used in this study. The schools that fulfilled the inclusion criteria were co-education and multi-racial students. Students were excluded from the study if they had disease problems (such as diabetes and food allergies), heart problems, physical disabilities and other chronic diseases. The approval of permission to conduct research in the schools were requested from the Ministry of Education, followed by the Penang State Education Department and the schools concerned. The study involved a total of 200 students but 6 subjects were excluded from the study for not able to fulfil the criteria due to health problems such as anemia, kidney problems and food allergy. Thus, the number of subjects taken into account was 194, of which 98 were male subjects and 96 were female subjects aged 16 and 17. Students were selected through a systematic random sampling.

Data was obtained by anthropometric measurement and questionnaires. Height without shoes was measured to the nearest 0.1 cm using the SECA body meter 208 (SECA, Germany). Body weight was measured to the nearest 0.1 cm using the digital TANITA balance HD319 (Tanita Corp, Japan). BMI was calculated using the weight and height (kg/m^2) data. Subjects were then categorized according to World Health Organization (WHO, 2007). The questionnaires included information of demographic, body image perception, body shape and weight control behaviors. Questionnaires were completed by students themselves. Students were given instructions and guidance before answering questions. Validity questions were tested in advance, to ensure that research subjects did not dispute during answering. Before the data collection, a pre-test was conducted on 10 subjects who were randomly selected among students in UKM. This pre-test was to determine subjects understood the questions in the questionnaires. Pre-testing is also essential for researchers to identify problems that may arise in the questionnaires and to estimate the time spent by respondents to answer the questionnaires.

The subjects were asked to complete a questionnaire that comprised 5 sections including demographic data, body image perception, body shape and weight control behaviors. Demographic data include sex, age, race, date of birth and health status. Questionnaire on body image perception include body weight perception and body shape. Body image perception was assessed using a modified version of contour drawing rating scale which has 5 pictures (Fig. 1 and 2). Based on the contour drawing, subjects were required to choose the picture that represents their current and ideal body shape.

Body dissatisfaction index was obtained by finding the absolute difference between the ideal body image and current body image (Fig. 1 and 2). The magnitude of body dissatisfaction index value of 0 to 4. The larger the value, the more dissatisfaction with the current body size. Negative value means that the subject desires to be thinner, while positive value indicates the current shape is smaller than the desired shape which means that the subject wants to be fatter than the current shape. This method is reliable and valid for assessment of body image perception (Thompson and Gray, 1995). Although this method is a global measurement, individuals can only identify the overall shape and not specific in terms of other body parameters. However, it can provide indication whether there is a difference between the current body shape and ideal body shape (Sabiston *et al.*, 2005).

The questionnaires also include weight control behaviors (WCBs) such as diet control, physical activity, drug use, exercise, reduction in calorie intake, special

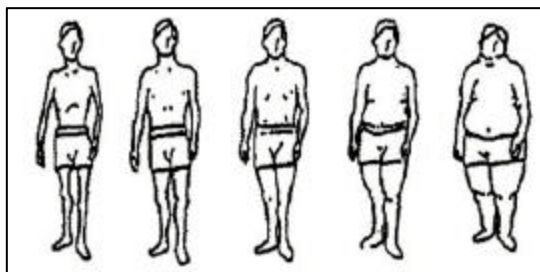


Fig. 1: Modified version of contour drawing rating scale for men

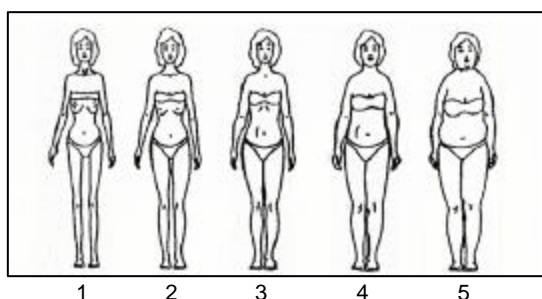


Fig. 2: Modified version of contour drawing rating scale for female

diet, use of weight loss pill, vomiting and so on. WCBs is a measure of weight control behavior containing sub scale behavior of a healthy diet (11 items) and behavior of an unhealthy diet (9 items) (French *et al.*, 1995). Each dieting strategies have been rated on a Likert scale ranging from 0-2; "0" indicates that they have not used, "1" indicates that they sometimes use and "2" is always using the strategy.

Data analysis: The data collected was analyzed by using Statistical Program Package for Social Sciences version 18.0 (SPSS Inc. Chicago, IL, USA). Descriptive statistical included mean, percentages, standard deviations and frequencies were reported. The difference between males and females in weight, height and BMI was determined by using independent t-test. Plus, the association between BMI and weight perception as well as between BMI and weight perception with weight control behaviors for both sexes were determined by using Chi-Squared test. For all analysis, significance level was set at $p < 0.05$.

RESULTS AND DISCUSSION

Profile of subjects: A total of 194 subjects comprised 50.5% males and 49.4% females were involved in this study. The subjects involved were randomly selected from two secondary schools in Penang and were in the range of 16 to 17 years old with a mean age of 16.7

years old. Mean age for male subjects was 16.6 ± 0.6 years old while for the female subjects was 16.7 ± 0.5 years. The majority of subjects were Malay (49.0%), followed by Chinese (34.5%), Indian (15.5%) and 1.0% of other ethnics.

Anthropometric data: Anthropometric characteristics of subjects are shown in Table 1. The mean body weight of male and female subjects were 67.2 ± 16.0 kg and 53.6 ± 14.6 kg, respectively, while the mean height of male and female subjects were 1.7 ± 0.1 m and 1.6 ± 0.1 m, respectively. Mean BMI for male subjects was 23.2 ± 5.7 kg/m², while for female subjects was 21.4 ± 5.5 kg/m². There were significant differences in weight, height and BMI between male and female subjects ($p < 0.05$). According to the BMI classification, most of the subjects, 55.2% (60.4% females and 50.0% males) were in the normal category followed by 17.5% (13.5% females and 21.4% males) as overweight. In addition, 12.9% (15.6% females and 10.2% males) were categorized as underweight category and 14.4% (10.4% females and 18.4% males) were obese.

These findings were different from previous studies conducted by Khor *et al.* (2009) on adolescents in the states of Penang and Kedah who reported that the prevalence of overweight (34.0%) and underweight (26.5%) was higher compared to this study. A study conducted by Lekhraj *et al.* (2007) on youth in the district of Klang, Malaysia, was almost similar to the present study which reported the prevalence of underweight and overweight were 15.0 and 16.6%, respectively. According to this study, when compared between sexes, the prevalence of overweight and obesity among men was higher than female (10.6 vs 6.0%).

Association between BMI and body weight perception:

The association between BMI with body weight perception are shown in Table 2. Results showed that among subjects who were categorized as underweight, the majority of 72% had accurately perceived themselves as underweight, 28% subjects perceived themselves having a normal weight and no one perceived themselves as being overweight and obese. For subjects within the normal BMI range, the majority of 57.0% had accurately perceived themselves, followed by 26.2% had perceived themselves as overweight, 16.8% had the perception that they were underweight and no one perceived themselves as obese. For BMI categories of overweight and obese, there was no one who perceived themselves as underweight. There were 47.1% subjects classified as overweight had perceived themselves as overweight, 35.3% perceived themselves having normal weight and 17.6% as obese. However, among subjects who were categorized as obese, only a

Table 1: Anthropometric characteristics of subjects by gender

AC	Mean±SD			p-value
	Male (n = 98)	Female (n = 96)	Total (n = 194)	
Body weight (kg)	67.19±16.03	53.64±14.57*	60.49±16.72	0.000
Height (m)	1.71±0.08	1.58±0.05*	1.65±0.09	0.000
BMI (kg/m ²)	23.17±5.74	21.37±5.46*	22.28±5.66	0.026

*There are significant differences between the two sexes (p<0.05). AC: Anthropometric characteristics

Table 2: Association between BMI with body weight perception

BMI	n (%)	Body weight perception				χ ²	p-value
		Underweight n (%)	Normal n (%)	Overweight n (%)	Obes n (%)		
Underweight	25 (12.9)	18 (72.0)	7 (28.0)	0 (0.0)	0 (0.0)	120.087	0.000
Normal	107 (55.2)	18 (16.8)	61 (57.0)	28 (26.2)	0 (0.0)		
Overweight	34 (17.5)	0 (0.0)	12 (35.3)	16 (47.1)	6 (17.6)		
Obes	28 (14.4)	0 (0.0)	3 (10.7)	15 (53.6)	10 (35.7)		
Total	194 (100)	36 (18.6)	83 (42.8)	59 (30.4)	16 (8.2)		

Table 3: Association between BMI with body weight perception by gender

BMI	Body weight perception				χ ²	p-value
	Underweight n (%)	Normal n (%)	Overweight n (%)	Obes n (%)		
Male (n = 98)						
Underweight	10 (100)	0 (0.0)	0 (0.0)	0 (0.0)	78.429	0.000
Normal	14 (28.6)	32 (65.3)	3 (6.1)	0 (0.0)		
Overweight	0 (0.0)	12 (57.1)	8 (38.1)	1 (4.8)		
Obes	0 (0.0)	3 (16.7)	13 (72.2)	2 (11.1)		
Total	24 (24.5)	47 (48.0)	24 (24.5)	3 (3.1)		
Female (n = 96)						
Underweight	8 (53.3)	7 (46.7)	0 (0.0)	0 (0.0)	93.338	0.000
Normal	4 (6.9)	29 (50.0)	25 (43.1)	0 (0.0)		
Overweight	0 (0.0)	0 (0.0)	8 (61.5)	5 (38.5)		
Obes	0 (0.0)	0 (0.0)	2 (20.0)	8 (80.0)		
Total	12 (12.5)	36 (37.5)	35 (36.5)	13 (13.5)		

small percentage of 35.7% perceived themselves as obese. Most of the obese subjects had a wrong perception of their body weight, in which a total of 53.6% subjects thought that they were just overweight and 10.7% still considered themselves as normal weight. Chi-squared test showed that the actual weight (BMI) had significant association with body weight perception (p<0.05).

The association between BMI with body weight perception by gender was summarized in Table 3. Almost half of the male subjects (48%) considered themselves as normal body weight, while the perception of underweight and overweight were the same percentage with 24.5% subjects, respectively, while only 3.1% subjects felt themselves obese. All the males who were in BMI category of underweight had correct perception. For those who were classified as normal weight, 65.3% had accurately perceived their weight, 28.6% subjects perceived themselves as underweight, 6.1% perceived themselves as overweight and no one perceived themselves as obese. For the category of overweight and obese there was no one who perceived themselves as underweight and only 11.1% in obese category were correct estimators.

For females, 37.5% subjects had normal body weight perception, followed by 36.5% subjects perceived

themselves as overweight, 12.5% subjects as underweight and 13.5% subjects as obese. For female subjects who were classified as underweight, there were 53.3% accurately perceived their weight, while 46.7% perceived themselves as normal weight. For the normal weight category, 50.0% subjects accurately perceived their weight, 43.1% subjects over estimated their weight who perceived themselves as overweight. In general, the results of this study showed that males who were overweight and obese were more likely to underestimate their weight than females. This finding was similar to the previous studies conducted by Muhihi *et al.* (2012) and Cheung *et al.* (2007) which reported more females than males were more likely to have perceived themselves having excessive body weight while more men than women perceived themselves as underweight. Chi-square test showed that there was a significant association between actual body weight (BMI) to the body weight perception for both sexes (p<0.05).

Accuracy of the estimated body weight: In general, the accuracy of the estimated body weight for male and female subjects are shown in Fig. 3. The present study showed that more than half of the subjects had accurately estimated their weight in which male and female subjects reported 53.1 and 55.2%, respectively.

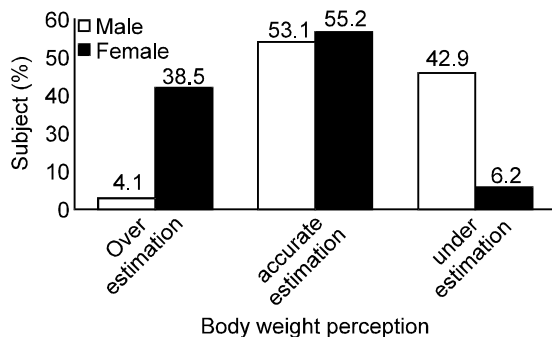


Fig. 3: Comparison between the gender in the estimation of body weight

Female subjects (38.5%) reported a higher number of overestimation of weight compared to male (only 4.1%). Meanwhile male subjects (42.9%) showed a higher tendency in underestimation of weight compared to females (16.2%).

Index of body shape dissatisfaction: Index of body shape dissatisfaction was assessed by calculating the absolute difference between the ideal and current body image (Table 4). The magnitude of index of body dissatisfaction was value from 0 to 4. The larger the value, the higher dissatisfaction with body shape. Negative value means that the subject desires to be thinner, while positive value indicates the current shape was smaller than the desired shape which means that the subject wants to be fatter than the current shape. The result showed that 39.8% male subjects and 30.2% female subjects were satisfied with their body shape and did not intend to change their current body shape. This showed that the majority of female subjects were more dissatisfied with their current shape than male. This finding was supported by previous studies in which females were more likely dissatisfied with their current body shape compared to males (Nichols *et al.*, 2009; Xu *et al.*, 2010).

These results were also consistent with a study conducted by Musaiger *et al.* (2012) which reported the majority of subjects, 65% were dissatisfied with their body shape. Subjects who had dissatisfaction on their body shape and intended to become thinner (82) were higher than subjects dissatisfied with their body shape and desired to be fatter (46). Female subjects were found to have higher dissatisfaction and desired to become thinner (51.0%) than male subjects (18.8%). Previous study by Khor *et al.* (2009) showed that females who had a sense of dissatisfaction with body shape were higher than males and they wanted a slim figure.

Weight control behaviors: Frequency results of healthy weight control behaviors by gender are summarized in Table 5a. Based on the results obtained, it was clearly seen that the majority of subjects for both sexes used all (12 items) of healthy weight control behaviors. Overall, for male subjects, the total of sometimes scale was 559 and 293 for always scale, meanwhile for female subjects, the total of sometimes scale was 575 and only a total of 259 for always scale in healthy weight control behaviour.

However, food diet and increase physical activity were only 2 out of 12 items that showed significant association between the sexes ($p < 0.05$). Weight control behavior such as food diet was higher among male than female subjects, in which 55.1% sometimes and 22.4% always used this weight control behavior, whilst for female subjects, only 30.2% sometimes and 26.0% always engaged in the practice. As expected, weight control behaviour such as increase physical activity also showed significant association between the sexes ($p < 0.05$), where 86.7% of male and 76.1% of female were engaged in this behavior. Results showed that male subjects who always increased physical activity (50.0%) was higher, compared to only 14.6% for females. The results of this study was consistent with a study conducted by Cheung *et al.* (2007), in which males were more likely to do exercise or restricted their calorie intake than female. Moreover, a study by Brener *et al.* (2004) also showed that fewer female took part in physical activities compared to males.

In addition to engaging in healthy weight control behaviors, the subjects were also engaged in an unhealthy diet. Based on Table 5b, results showed that majority of both sexes were involved in all (9 items) unhealthy weight control behaviors. Overall, female subjects recorded the highest total of both scales, in which 132 for sometimes and 63 for always. While for male subjects, the total score for sometimes and always scales were 117 and 25, respectively. However, there were only 3 items which showed significant associations between the sexes ($p < 0.05$). Those items were skipping meal, starting to smoke and fasting. For weight control behaviors such as smoking, the percentage of male who smoke was 17.3% (12.2% sometimes and 5.1% always). However, there were few girls who used these weight control behaviors, which was 3.1% (1.0% sometimes and 2.1% always). This was extremely worrying because young girls were starting to get hooked to improper behavior and this menace should be addressed promptly.

In addition, as expected, skipping meal was more prevalence among females than males. More than half of the female subject skipped meals (86.5%), which recorded the highest percentage scale of sometimes

Table 4: Indices of body shape dissatisfaction by gender

Subjects	Dissatisfaction index										χ^2	p
	Subject desires to be thinner					Subjects desires to be fatter value						
	-4	-3	-2	-1	0	1	2	3	4			
n (%)	0 (0)	7 (3.6)	20 (10.3)	55 (28.4)	68 (35.0)	36 (18.6)	5 (2.6)	3 (1.5)	0 (0)	16.993	0.009	
Males (%)	0	0	7.1	26.5	39.8	22.4	1.0	3.1	0			
Total			33.6		39.8			26.5				
Females (%)	0	7.3	13.5	30.2	30.2	14.6	4.2	0	0			
Total			51.0		30.2			18.8				

Table 5a: Frequency of healthy weight control behaviors by gender

Healthy (WCBS)	Male n (%)		Female n (%)		χ^2	p
	Sometimes	Always	Sometimes	Always		
Eat less	45 (45.9)	14 (14.3)	50 (52.1)	17 (17.7)	2.004	0.367
Reduced fat food	46 (46.9)	19 (19.4)	55 (57.3)	19 (19.8)	2.982	0.225
Eat more fruits and vegetables	44 (44.9)	43 (43.9)	44 (45.8)	38 (39.6)	0.648	0.723
Reduced intake of snacks	43 (43.9)	26 (26.5)	55 (57.3)	16 (16.7)	4.126	0.127
Reduced unhealthy snacks	60 (61.2)	16 (16.3)	58 (60.4)	14 (14.6)	0.234	0.890
Eat foods that are low in calories	58 (59.2)	15 (15.3)	47 (49)	17 (17.7)	2.117	0.347
Eat less carbohydrates/sugar	53 (54.1)	18 (18.4)	54 (56.2)	16 (16.7)	0.125	0.939
Take food diet	54 (55.1)	22 (22.4)	29 (30.2)	25 (26.0)	13.952	0.001
Changes to nutritious food	56 (57.1)	29 (29.6)	63 (65.6)	22 (22.9)	1.519	0.468
Eat less meat	44 (44.9)	15 (15.3)	48 (50.0)	10 (10.4)	1.166	0.558
Increase physical activity	36 (36.7)	49 (50.0)	59 (61.5)	14 (14.6)	27.773	0.000
Total	559	293	575	259	1686	

Table 5b: Frequency of unhealthy weight control behaviours by gender

Unhealthy (WCBS)	Male n (%)		Female n (%)		χ^2	p
	Sometimes	Always	Sometimes	Always		
Skipped meal	36 (36.7)	4 (4.1)	42 (43.8)	41 (42.7)	59.391	0.000
Smoking	12 (12.2)	5 (5.1)	1 (1)	2 (2.1)	11.402	0.003
Take a liquid dietary supplement/meal replacement	23 (23.5)	4 (4.1)	20 (20.8)	3 (3.1)	0.359	0.836
Use a laxatives medication	3 (3.1)	1 (1.0)	2 (2.1)	0 (0.0)	1.180	0.554
Use diuretic medications (water pills)	5 (5.1)	2 (2.0)	1 (1.0)	0 (0.0)	4.733	0.094
Use diet pills	3 (3.1)	2 (2.0)	5 (5.2)	3 (3.1)	0.818	0.664
Vomiting intentionally	4 (4.1)	0 (0)	7 (7.3)	3 (3.1)	4.154	0.125
Fasting	26 (26.5)	7 (7.1)	46 (47.9)	11 (11.5)	12.925	0.002
Use drugs to reduce appetite	5 (5.1)	0 (0.0)	8 (8.3)	0 (0.0)	0.810	0.368
Total	117	25	132	63	337	

and always, 43.8 and 42.7%, respectively compared to male subjects, which were only 50.8% who skipped meals (36.7% sometimes and 4.1% always). Based on the study by Pon *et al.* (2004), for the normal weight category, the fear of becoming obese can be a motivator to skip meals regularly. According to this study again, skipping meals is a method of weight control behaviors and it is common regardless of weight category of the subjects. Meanwhile, Wong *et al.* (1999), found that the frequency of skipping breakfast and lunch were quite high even among female in medium weight. So it was not surprising that the results of this study indicated the frequency of skipping meals was higher among female than male (Table 5). According to Neumark *et al.* (2006), this behavior would lead to weight gain, not weight loss. In addition, this would cause the obesity epidemic to continue and will be increased from time to time if the adolescents were not given adequate attention and exposure. Moreover, the majority of female subjects also fasted to control their weight. More than half of the female

subjects engaged in this unhealthy behavior, which was 59.4% (47.9% sometimes and 11.5% always). While for male subjects, there was 33.6% fasting, including (26.5% sometimes and 7.1% always). The data obtained in this study regarding unhealthy weight control behaviors of skipping meals and fasting was consistent with previous studies. The previous finding also found that 57% of females and 33% males have used unhealthy weight control behaviors which were skipping meals and fasting (Neumark-Sztainer *et al.*, 2002). Based on the results obtained, it was quite a worrisome. Thus, appropriate attention to adolescents should be given due to their limited knowledge in weight control behaviors that resulted in the rapid increase of obesity related diseases.

Conclusion: The actual weight (BMI) of subjects were significantly associated with body weight perception for both sexes. A significant association between the selection of the current body shape and ideal body shape for both sexes was also identified. Food diet and

increasing physical activity were only 2 out of 12 items of healthy weight control behaviors used and had showed a significant association between males and females. While for unhealthy weight control behaviors, skipping meals, starting the use of tobaccos and fasting were 3 out of 9 items that showed significant association between the sexes. The practice of unhealthy weight control behaviours is associated with poor nutrient intake and weight gain over time. These findings could help health authorities in planning programs and campaigns to promote healthy lifestyles and to address issues related to perception about body weight. Adoption of healthy lifestyles such as good diet and engaging in physical exercises should be encouraged among this population of teenagers in Pulau Pinang. Further studies should be conducted to identify socio-cultural factors that could influence the perception of body weight among adolescents.

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